CITY 4

COMPUTER
OPERATOR'S
MANUAL

CITY GAMES

Price of City Games
Computer Files Includes
Related Manuals

COVER SHEET

City IV
Computer Operator's Manual

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TABLE OF CONTENTS

I. INTRODUCTION

City IV is an operational simulation game in which participants make economic, government and social decisions affecting a hypothetical metropolitan area. Through the use of a computer, the simulated urban system responds to the participants; decisions as any real city would. Each player in City IV is assigned to a team which shares an economic and governmental role. The interrelated decisions made by teams will guide the way the simulated city changes in composition and size.

The simulation approach to cities offers the players an opportunity not only to make decisions but to implement them as well. They receive a feedback from their actions and see the effects from other forces that are constantly at work altering the effectiveness of the players' decisions. Players therefore have a learning experience in how to deal with a changing environment. The round-by-round play gives the players the necessary experience in selecting the type of analysis to move them towards their objectives while the allocation of their time and Game resources is a critical determinant of the success they hope to achieve. As the Game progresses, players learn to increase their involvement in the management of the environment while at the same time learning more about the relationships between business and society.

One of the primary purposes of the Game is to improve the players understanding of urban problems in systemic terms. In other words, the aim is to encourage players to view the activities of the City as being closely related and interdependent (e.g., an unemployment problem will exacerbate a health problem, the loss of industry and jobs in the private sector will reduce the number and quality of services offered in the public sector through reduced tax revenues, etc.). The Game also encourages players to use an interdisciplinary perspective when dealing with urban problems; that is, to look at the problem not only from the viewpoint of an economist, but also from the perspective of a geographer, planner, political scientist, etc.. For instance, if a player is dealing with a land use problem such as zoning, he soon realizes that he cannot escape the broader concepts of land-use planning. The problems of housing, unemployment, education, health, highways, etc., are all related in a system of interconnected activities and institutions to his original land-use problem of zoning. Hence, many of the outputs of this particular gaming model (e.g., land use maps, economic indicator tables, etc.) are designed in such a fashion that the City can be viewed more easily as a single entity than as several separate and disparate parts.

Although no two games are ever identical, most games have common characteristics that are noteworthy. In a typical game, the economic decision makers can best be described as rather conservative and cautious players. This aversion to risk-taking is especially noticeable in the early rounds when players are uncertain as to the outcome of particular decisions. Economic decision makers generally do not have a game plan and most decisions in the early rounds are not made in a systematic fashion or

1

developed in a coordinated manner. In later rounds, many decisions are
made as the result of actions taken in earlier rounds. For example, an
economic decision maker might build some housing units for rental purposes
and then find that they are underutilized. The decision maker might then
consider building commercial or manufacturing establishments close by in
order to induce more people to live in the underutilized housing units and
build up a good supply of labor. Just as likely, the procedure would be
reversed, and the emphasis would be on building housing units near a pre-
viously built manufacturing plant in order to maintain an adequate supply
of labor close to the plant.

The economic decision makers usually make profits on their business
operations, although losses on particular investments are not uncommon.
It is characteristic of economic decision makers that profit maximization
is the primary motive for making decisions, subject, of course, to the twin
constraints of risk-taking and uncertainty.

The public decision makers attempt to make a concerted effort to improve
the welfare of the City, although the indicators used to measure economic
progress do not clearly reflect the intensity of this effort. During the
early rounds, a typical game plan is to obtain additional revenue to up-
grade the school system and municipal services, while at the same time
attempting to redistribute the tax burden to fall more heavily on the
business community and to a lesser extent on the work force. Lower
income residents generally receive a tax break through the reduction of
the sales tax on goods and services while the tax on auto owners is raised
in the hope that the use of public transportation will increase.

The social decision makers are the citizens who live and work in the
city. They are the voters and purchasers of goods and services needed to
complete a real city. The social decision makers serve as the equalizing
force to the government and economic systems. Their desire for leisure
directly controls the amount of extra work, adult education, politics and
recreation that they will participate in. Their voting power and environ-
mental expectations directly influence the course of government. Social
dissatisfaction can lead to boycotting businesses and industries as well
as schools and municipal services. Their demands influence the type of
housing and transportation they will accept which in turn effects all other
parts of the municipal system. If city conditions are acceptable to the
general population, inmigration occurs and the city grows. Otherwise,
outmigration can send the city into bankruptcy if it continues for any
duration of time. In short, commercial and government decisions ultimately
must satisfy the general population if any city is to survive in the long
run.

As in a real city, the public deficit looms as an obstacle in the path
of all social reforms. So it is with the City game. The public administra-
tors must face the debt problem and solve it before money can be allocated
insignificant amounts to create the utopian society we all dream about.

2

These administrative processes that implement social reforms require the integration of decision making through the various disciplines. As the game progresses, the conflict between the objectives of the public and private sectors becomes amplified. Both sectors begin to realize that they cannot perform their objectives independently and the learning process begins. As an example of this learning process, begins. As an example of this learning process, consider the micro-level analysis of shopping centers which are simulated by the "personal goods" and "personal service" industries. To perform this analysis, appraisals are required along with business and property analysis. Investment portfolio analysis is required to manage a variety of business enterprises and a portfolio of real estate resources. The constraints on the entrepreneur come from the public sector in terms of zoning restrictions, building permits, taxes, utilities, etc., which can prove very formidable. Hence, the public and private interests become interwoven and the Game provides a way of demonstrating decision-making in a society where there is a community of interest between the public and private sectors. The inefficiencies of independent decisions become expensive not only to the developers but to the community as a whole, so it becomes evident that it pays to have an improved analysis of the problems of managing the environment in order to achieve public objectives, whatever they may be.

The Director's manual is designed to be a reference manual and cannot be read as a text book. This manual is one of a set comprised of a Director's Manual, Player's Manual, and Computer Operator's Manual. It is assumed that players will be given complete instructions in the rules for a particular game play by the Game Director who is experienced in running this particular game. Individual players will use only those portions of the manual that are applicable to their game role.

In the playing of the actual game, participants assume various roles in the public and private sectors as outlined in the players manual. A Game Director who is familiar with the Game in detail begins the Game with a class room type lecture devoted to the discussion of the major decision-roles in the City Model as well as the many printouts and reports that result from each role player's decision inputs. During this session, players are assigned a particular role (i.e., economic decision maker, mayor, school board member, etc.) and asked to read that portion of the Player's Manual dealing with his role. Using the manual as a technical guide, the players address themselves to the mechanics of coding forms and interpreting the computer printouts. It is at this time that the Director describes the preprogrammed city in the computer to the players. The Director has the option of choosing initial parameters such as economic growth rates, social conditions, production capacities, etc. to suit the particular objects of the players and thereby making the Game more flexible and susceptible to innovative approaches to urban problem solving. The Director can structure the role assignments to be directed at individuals

3

who concentrate on single objectives such as heavy industry to multi-disciplinary task forces to consider urban problems within an inter-disciplinary framework (e.g., a task force on transportation policy might include a sociologist, political scientist, geographer, planner, engineer and an economist).

With initial roles established, the game beings. The Director generally starts the game by discussion possible objectives with each player or group of players along with the present or initial city conditions. For example, if the Director chooses to use the planning-programming-budgeting systems approach, each player or group of players must:

1. Define his general Goal which is Output Oriented.

2. Identify objectives which indicate conditions or levels which must be obtained or maintained to successfully reach the designated Goal.

3. Draft Programs which are designed to achieve the standards set by the various objectives.

4. Evaluate the Programs to determine their effectiveness (in cost/benefit terms) as compared to alternative programs. Consider a political role in the urban system that is abstracted as follows:

   Political Goal: School Department
   Develop a school system comparable to the best in the nation, which will provide high quality, accessible and meaningful educational experience to the City's population.

   Objective #1
   Maintain the pupil/teacher ratio at less than 21/1.

   Program #1
   Using the population growth projections, determine future student levels. Hire middle and high income teachers, at the optimum mix, to meet this demand.

   Program #2
   Redistrict school boundaries to better utilize existing City resources.

   Program #3
   Construct new schools or add to existing facilities as pro-jected. (Specific round-by-round projections are used.)

4

Objective #2
Keep unmet demand for adult education at less than 10%
of the total demand.

Program #1
Use the population growth projections, determine future
student levels. Hire middle and high income teachers, at the
optimum mix, to meet this demand.

It can be seen that the School Department has:

1. A definite goal (to be the best)

2. Identified meaningful standards of performance (student/teacher
    ratio of 21/1 and unmet demand for adults at 10% or less)

3. Determined approaches to achieve these standards (population
    projections, new construction, redistricting, etc.)

The previous example of the School Departments (see page 59*)
political goal could apply to most school systems in any City. We all
want low student/teacher ratios and the best possible teachers for our
children. New construction, better utilization of facilities and adult
education programs with the most competent teachers available is certainly
a laudable goal. The only obstacle to this utopian dream is that other
government departments have their dreams and all departments compete for
the lion's share of limited tax dollars. Besides education, the government
sector (see page 48) must consider the problems of budgeting, taxation,
assessment and bonding (see page 48), highways (see page 75), fire and
police protection (see page 48), planning and zoning (see page 76),
utilities and bus and rail transportation (see page 91). Departments
make decisions which include allocating capital and current funds,
changing salaries and maintenance levels, requesting Federal/State aid,
changing district boundaries, constructing or demolishing public buildings
and changing levels of service.

In the game, all of the above roles are enacted by various players
who strive to optimize their goals just as in the example of the school
department. Collectively, the Government players work from a tax base that
is continually being attacked by the tax payers as excessive and yet their
very employment is insured by the elective process which, of course, is
determined by the same tax payers who are continually demanding more
services from the government. The source of government revenue is taxes
which are levied on the population just as in a real city. Other players
must assume roles in the city's economic sector to create employment for
the population. The activities of the businessmen must include the opera-
tion of the industrial, commercial, and residential establishments which

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* All page references in the Introduction refer to the pages in the
  Player's Manual.

5

in turn require land purchases and sales, salary changes, maintenance level alterations, business goods and services, purchases for operation exigencies, boycotts of commercial firms, acquisition of long and short term loans, and constructing, improving and demolishing businesses.

The commercial activities (see page 9) are subdivided within the game into Basic Industries, Construction Industries, Commercial Activities and Residences. The Basic Industry includes heavy and light industries and national services (including Standard SIC classes) which spend money for business goods and business services, utilities, a labor force, transportation and above all taxes. The Construction Industry (see page 22) builds and/or demolishes other developments and firms from outside of the local area may also perform construction work. Commercial activities spend money on many of the same items as the basic industry in order to maintain a level of service capacity. This service capacity is available to serve local customers. Finally, the residences, (single-family, townhouse, and highrise) spend money on goods and services, utilities, taxes and earn income based on rent charged and the number and type of occupants residing in their housing units (see page 29).

The social sector (see page 36) is concerned with the income and expenditures of the population (see page 36), the dissatisfaction (see page 38) of the population in terms of housing, personal situation in the community, employment, and the amount of leisure time they can afford. Migration (see page 39) considers the movements of population in and out of the city. Finally the social sector members vote (see page 40), Boycotts (see page 41), allocates their time for work and play (see page 41) and sets the dollar value on their time (see page 46).

The City model selected for game play may be a typical city or it may be the player's own city. The model employs a grid board (see page 2) Player's Manual) geographical map that can be loaded with data from any regional or metropolitan area. The map contains 625 parcels in which each parcel represents one square mile of land. Many of these land parcels are unowned at the beginning of play and those that are occupied are represented by a specific, representative land use. For instance if a square mile consists mainly of middle income residences, this parcel would be designated as such even though there could be a few commercial businesses within the square mile. The only requirement to assigning parcels is that the assignment typify the most representative land use. In a similar manner highways and roads are represented along the boundaries of the parcels. If you imagine a parcel as represented by a square, then a road is described as one or more sides of the square.

Once the representations are made, there remains the task of assigning numerical values and indexes to the many parts of the city's functions. For example, when various types of businesses are identified, they must be labeled with their dollar volume and prices for their products. Residences must be identified as to type and amount of rent paid. Voter

6

registration and social dissatisfaction indexes must be established along with zoning classifications, cash availabilities, government expenditures, taxes road configurations and utilities and the election of city officials. These inputs along with the parcel classifications describe the starting city. The files of this starting city are stored in the computer and can be altered by the game director to suit the players needs (see Director's Manual). Changes in these files may affect the output of the computer but will have no bearing on how the computer calculates the output. The computer program directs the computer to act upon the data files in fixed relationships using the various data stored in the city file. In this way the computer can respond to updated file changes, act as an outside system, perform routine functions or processes that would be time consuming for the players and finally act as a bookkeeper (see Computer Operator's Manual).

At this point the game is ready to be played. Each player studies his printout generated from the starting city to evaluate his status as an individual and as a team member. Each team defines its specific problems, establishes objectives and develops strategies. Various groups will then gather for informal sessions for the purposes of bargaining, trade-offs and consumating deals. Eventually each group arrives at final decisions for actions to be taken in that particular round of the game. These decisions are then entered into the computer by a special code and the model is ready to run. The computer then prints out a new series of data representing the changed city.

In a typical game play the players generally behave in a predictable way with a minimum of player interaction early in the game. Players tend to feel that most interrelations should be avoided for the sake of secrecy. Most players use the guise of ignorance when talking to their peers early in the game and their contacts are limited to attempts at acquiring knowledge. As the player's command over the technical content increases, so does his awareness of the necessity for a properly functioning system. The player realizes that his economic aspirations will not be achieved unless his public counterpart can create a suitable "service-rich" environment in which he can operate. Typically, one or two players generally emerge quickly with an extensive grasp of the system and its technical content and assume the role of educator. In a fashion similar to the old ward politicians, the educators disperse favors (the patronage in the form of technical explanations), to gain the initial respect of his constituents. Needless to say, it is then a simple matter for the educator to insure his election to the mayoralty of the City.

As time passes, other players come to understand their role and the role of others and begin to realize that the mayor, although helping the city to function, often is insuring his own economic prominence at their expense. At this point, the era of the ward politician is inevitably (or generally) over and with this passing comes the emergence of the

7

city-manager. The political cooperation that grows from the new regime eventually leads to a full appreciation of the efforts of others and will open up higher levels of discussion concerning city-wide urban problems. Although the previous discussion concerns player behavior during game play, the influence of the gaming process has created a learning experience is one of the fundamental purposes of City Games and these experiences with the game can be transferred to the problems of the real city.

In most games, the Game Director's role diminishes as the play progresses and players become more familiar with the technical content of the game. Since bribes and boycotting are allowed along with collusion and other forms of special interest groups, a new aspect of the game appears, namely law and order. Players rapidly learn that disputes cannot be settled by opposing interest groups and the enforcement of agreements and compromises becomes almost impossible. Players demand legal systems and police departments and the local government is faced with new expenses to deal with. If these demands are met, the City managers must generate more income to meet these expenses and forego other spending plans. At this point, the hypothetical city is becoming very real and very complicated to run. Even though it is a hypothetical city, players become emotionally involved and the intensity of their involvement permeates the playing area. Time is a constant enemy for the players just as in real life. Everyone wants everything at once and a typical game play allows the players about two to three hours per round to make their decisions. One round of the game is equivalent to one year of real time. If elections are required every two years, only two rounds are played before new elections. If the newly elected officials fail to honor prior commitments by their predecessors, well, the best laid plans .....!!

It is within this framework that the City IV manuals are written. There are three manuals for City IV; a Director's Manual, a Players' Manual, and an Operator's Manual. The Director's Manual is designed to explain the technical content of the computer program including term definitions, programming change procedure and the numerous technical details associated with the game. It is assumed that the Game Director has been taught the gaming operations prior to assuming the Director's role and will use the manual as his primary reference source rather than a set of instructions for running the game. The manual further assumes that a Director has had training in Fortran programming and understands formatting and coding in addition to being knowledgeable about Urban problems. The Director designs the initial city conditions for the start of a game. The manual provides initial conditions for a typical city and specific computer commands for altering these conditions.

The Players' Manual is also designed to be a reference manual and not a text book. The complexity of the game requires extensive reading on the players part prior to the start of a game or selective reference material which is coordinated with the Director's introductory lectures

8

and possibly monitors who are trained in the gaming procedures and will coach the individual players when required. This latter approach has proven to be the most effective method of training players. If past games are indicative, individuals seem to learn their roles much faster when coached by a monitor during actual playing conditions as opposed to concentrated reading and memorizing prior to the start of a game. It is not presumed that players have prior knowledge of this game or even simulation in general. The game is designed so players do not need to know computer programming or how to operate the computer. These functions lie with the Director and the Computer operator.

The Operator's Manual is written for an IBM 360/370 and is distinguished from the Director's Manual by design. This distinction lies in the reasoning that the game director is responsible for the game room activity which includes the coding of inputs for the computer whereas the operator is responsible for all communication with the computer which is necessary to give the Director proper computer output.

The Operator's Manual assumes the reader is familiar with IBM 360/370 Operating System and its Job Control Language or at a minimum be able to obtain assistance from a local computer center. After processing one or two rounds of the model, the operations required become routine and require JCL and system knowledge only during system errors.

In general, the game should be played with at least 50 players utilizing a large room where players can move freely about. Computer printouts are usually taped on walls for easy access by all players. An optional display would be a gaming board for visual display of the city. The board is marked off in grids to conform to the City map and plastic playing pieces are used to represent the various types of buildings. Colored tape is used to mark off highways and boundaries. Colored tape is used to mark off highways and boundaries. Human interest is added if one player agrees to become the Big City News editor. The idea is to subtly report on the good and bad features of the game play in a humorous way. The Game Director reports the results of each round to the news editor who proceeds to write this paper and distribute it before the players learn the results of the round. The detailed computer outputs are then distributed to the players so that they may learn how well their particular game plan went. In other words, the paper presents the overview and the computer reports on the specifics. This method allows the Game Director to concentrate his time on selected areas rather than all areas at the end of each round.

In addition to the normal problems of the City, the Gaming Model can be used for more sophisticated analysis. The Economic Base can be investigated to determine the causes of a changing growth rate along with identifying the components of the economic base. Business cycles can be explored since they are dependent upon sales of goods and services outside the local economy and must be supplemented by an analysis of the condition of the National economy. This provides a useful yardstick for

9

measuring economic performance. By charting the prices for basic industry output, the return on investments and the interest rate on loans and bonds, the players can determine which phase of the business cycle they are in, which in turn would partially explain capital investment attitudes.

Other basic studies important to public and private decision makers concern the tracing of population growth and projecting future levels. Trends in employment (total), employment distribution by industry, un-employment rates and income distribution are available and in a usable form in the City's output. Here again a PPBS format would guide the player in assembling the pertinent facts and disregard peripheral information.

Housing market analysis becomes important in any geographic area where dwelling units are in competition with one another as alternatives for the users of housing. This problem incorporates many of the previously mentioned types of analysis: economic base, employment trends, income distribution and population analysis along with the additional component of housing stock or inventory. The magnitude of the total housing stock in terms of dwelling units, reflecting changes over time, is one of the most significant indicators of city growth coupled with a changing distribution of the inventory by structural type. Equipped with this knowledge plus an awareness of vacancy rates, rents, property values and financial market conditions, the private developer could make a rational decision as to the advisability of a housing investment.

Appraisal theory can be utilized to aid prospective purchasers and sellers as to the market value of particular parcels of land. The data needed to apply to the cost, income and marketing approaches to appraisal theory is available on the various output sheets supplied by the game.

The problems of social reform can be explored in terms of social dissatisfaction and leisure time demands. Social players determine the amount of money they will pay for transportation and variety of ex-periments in public transportation can be tried. Since the social players are the voters, political boundaries and voter redistricting are viable possibilities within the gaming framework. The problems of slum clearance and urban renewal in general are an integral part of game play and many ideas can be tested utilizing the game.

The above are only examples ot types of game play because each time a game is played, it is structured to meet the needs of the particular group of players. Players can be richly rewarded with a learning experi-ence that can be applied to real city problems. The variety and combina-tions of gaming situations are endless just as in a real city. The players themselves insure that no two games are identical because individual player's are not identical. In this sense, City IV is a teaching game that portrays the abilities of the particular players to manage a city.

10

II.   THE COMPUTER SYSTEM

A.   Computer Specifications

The hardware requirements are:

1 nine track 800 B.P.I. tape drive

1 132 print position line printer with overprint capabilities

1 80 column card reader

1 2314 disk drive

1 2319 disk pack and at least 190k of available to a user's program
   storage, running under O.S.

Most IBM 360/50 and 370/155 and larger IBM 360/370 computing systems
have their basic hardware facilities available to users. However, it is
possible to have difficulty with a request for a 2319 disk pack. Frequently
it is necessary to show justification for the acquisition of a whole
disk pack. The following is the justification from the system programmer's
view.

   a.   The model uses a minimum of 90 cylinders of the total capacity
        of 200 cylinders of 2319 pack.

   b.   The disk could be used to save the data base of previous rounds
        of the urban region's growth. Since each round on the average
        requires ten cylinders of disk space, a ten year history of the
        region would require 100 cylinders. Hence, the minimum require-
        ments plus space for a ten year history would occupy almost a
        total disk.

   c.   It is sometimes possible to store the executable "Load Modules"
        of a system of programs in the system library of the computer
        center. However, the City IV "Load Modules" occupy 300 tracks
        which are undesirable for storage on the system libraries.

   d.   It is necessary for program operation that the game file which
        occupies 200 tracks, be totally resident on one disk.

The disk would be a private volume which would be removed from the
system configuration as long as the City IV programs are not in execution.

In addition to the hardware demands, it is necessary that the standard utility programs of an IBM 360/O.S. system be available. Those that are immediately necessary are:

  a) IEHDASDR

  b) IEHLIST

  c) IEHPROGM

  d) IEBPTPCH

B. City IV Model Installation

Assuming that all hardware and software demands are met, installation can be done with the execution of two simple job steps. Job RBMINSTL consists of two steps -- RBMDISK and RBMVTC.

  a. RBMDISK is the step which restores the disk from the tape provided with this manual, e.g., RBM001

  b. RBMVTC produces the volume table of contents for the disk and its partition data sets of all files are listed. The private disk pack provided by the computer center and with serial number name, e.g., D12345 is restored with the City IV system. The nine track tape provided with this manual contains the system of programs and data to be restored to the disk. The disk would be initialized with some serial numebr name D12345 by the center before the execution of the RBMDISK step. Thus, the DD statement which references the disk in this step must be changed to reflect the serial number of the disk obtained. As a result a change from say a serial number D00001 on the DD statement VOL = parameter to D12345 or whatever is the disk serial number provided is needed. This should be the only change of the JCL required, since this step, RBMDISK, changes the serial number for all future steps to D00160. Be sure to inform the computer center operators to change the label ID of the disk at the end of the job to D00160, so that they could fetch it from the disk library in the future by its correct name. Note that it is sometimes necessary to make the same type of JCL change for the tape reference DD statement.

RBMVTC produces the VTOC so that a programmer can tell the allocation of space on the disk. Since this is a random access device it is possible that some files would occupy tracks which are not sequential. It tells the number of extents the particular data set has. RBMVTC could be executed after a couple of rounds of play so that the operator can tell the present number of extents of the DATABASE file. All files are described in Appendix B.

12

C.   The Game Sequence

     Each round of the City IV game represents the year in the life of
the urban region, and it takes about two hours of participants time in
the game room. When the players have completed their decisions are coded
for computer input and punched on cards. After the input is put into the
computer, the computer operates on the new data, relating it to the previous
urban conditions and produces output containing detailed information about
the new status of the city. The outputs are indeed yearly reports of the
region. These outputs are returned to the gaming room to be studied by
the players who after about two and sometimes three hours of decision-
making and analysis submit more inputs to the computer.

     A weekly schedule of one two hour meeting and one additional hour for
smaller group planning, about a day before works well in an educational
environment. For example, two hours of gaming on Wednesday afternoon.
The director codes and punches data for input. The operator submits first
trial edits on Wednesday night, and the director checks the edits and submits
a final input to the operator for Thursday. The operator submits it on
Thursday night and has until Monday to make sure that computer down-time
and other computer center probelms don't affect the City IV turn-around
time. On Monday participants could pick up their output and have a small
group meeting for one hour. Then, on Wednesday the full game room operation
continues.

D.   Loading the Data Base

     The urban region that the game director chooses to use must be loaded
into the DATABASE file. This loading is done in a two step process of the
job RBMLOAD. The first step CTYLDMN of RBMLOAD uses FT01F001 as the input
DD name for an input file which is either in a PDS (partition data set)
of RBM Library names EPA049. DATADECK LIBRARY (member name) or is an
input data stream on the principal card reader. This capability of
having the input for this step come from a PDS allows the storage of
different urban regions in the datadeck library. At the same time
experienced directors can create their own initial load data decks for
either a hypothetical or real city and input them directly before previous
storage in a PDS. CTYLDMN uses this data to produce the data base for round
zero which it creates in the game file, GM, referenced through DD name
FT04F001 with DSN = EPA049.GM. This step produces a printer output of
a listing of the load data deck, which describes the region, and a few
maps of the region at round zero.

     The second step of this job, step DUMP executes the program CTYFLDP,
which is a city file dumping routine to copy the GM file to the DATABASE file
and vise versa. The sequential data set GM which was produced in the first
step LOAD is now copied by CTYFLDP to the DATABASE file referenced through
DD name FT08F001 and DSN = EPA049.DATABASE. The principal purpose of the
DATABASE file is to save the data base of the previous rounds of the urban

13

region by extending the data set after each execution of the step RBMCITY, which produces a new round in the GM file. Hence, this step simply saves a copy of the round zero data base in the DATABASE file. The printed output obtained in the first step could be used by the game director to decide on alterations and other minor changes, he would like to effect before he presents round one to the game participants. These changes are explained fully in the Director's Manual.

E.   Running the Model

At this point it is good to look back for a moment. The first phase, installation is usually done only once at the center unless by accident the disk files were damaged. The second phase is done each time the Game Director wishes to use a different urban region from round zero. The third phase of running the model is done for each round of the game. As far as the operator is concerned, running a round of the model consists of the execution of at least two jobs. The overall objective is to produce round number n + 1 from an existing round number on which is previously saved in both the GM and DATABASE files. As recalled from the previous phase the round zero data base is in both the first of the DATABASE files and in the GM file.

The first type of job, RBMEDIT, which could be repeated until the director is satisfied with the output is a trial editing run. The inputs generated either by the director or in the game room is the input to this single step job. The output is a trial edit sheet describing the success or failure of the inputted decisions. In the case of syntax or sequence errors on the part of the director, corrections are made. Thus, in short, the error messages produced help the director to make the corrections. The adjusted input stream is resubmitted and the job is repeated until the director is satisfied with the edits. The program which is executed in this single stage job is EDTMAIN which slightly alters the data base in the GM file in addition to producing the printed edits.

The second type of job, RBMCITY, is run only once for each round and it is the job that changes the rounds from n to n +1. This job is made up of four steps. Since the only true copy of round n data base is in the DATABASE file at this point, the first step resets the now altered GM file to the original data base for round n. This step, DUMP uses a control card in its input stream following the DD name FT01F001 DD *JCL. The format of the control card is L in column 1 and an integer m in column 10. For m = 1 on the control card, the program CYTFLDP would copy the first file in the DATABASE files into the GM file. In general, m is an integer equal to the units digit of the round number of the data base to be altered plus one. For example, suppose as is the case with the first execution of this job that round zero is the data base to be altered, then n = 0, the unit digit of n is 0 and thus m = 0 + 1 = 1 (with n = 25 m = 6). This procedure is adopted because the DATABASE file is created with enough space for only ten rounds of data base storage so that after the round number of 9, the round number 10 data base overlays the original round number 0 data base.

14

The second step, EDIT, is exactly like the single step of the previous job RBMEDIT, however this time it produces a final edit sheet which is posted in the game room with the rest of the output of this job.

CITY3 [1]is the third step in which the program CITY3 generates the new round which is in the GM file at the end of this program. A permanent copy is obtained with the execution of the fourth step.

The final DUMP step executes CTYFLDP to copy GM file to the new extention of the DATABASE file. This DUMP execution of CTYFLDP does not require a control card unless the new data base created is one in which the space required for storage in DATABASE would cause an extention beyond the available space. For example, when n + 1 is generated with a change in the tenths digit of the number, i.e., if n = 9 and n + 1 = 10 then round ten must be saved in the first file location of DATABASE. Hence, this occurs at n + 1 = 10, 20, 30, etc. In this case the control card follows the DD* statement and simply contains F in column one.

The final phase of the process is the printing of the maps which could either be a separate job or an additional step to job, RBMCITY. The step MAPS executes MAPA which produces from the GM file a series of maps of the data base that is stored there.

It is always useful to obtain at least two copies of the printed output. This could be indicated to O.S. through the JOB card information on accounting, which varies at each computer center. The operator should request the necessary information and include the two copies parameter on the JOB card for this RBMCITY job.

The execution time of this job RBMCITY varies with the characteristics of the IBM 360/370 facility from 17 minutes to 40 minutes CPU time for the TWOCITY data base, on the model 50 and the model 155 does the same thing in 9 to 12 minutes. The number of lines printed for each copy is fifteen thousand for TWOCITY and 22,000 for RAYWID.

F.   Running Multiple Games

At some institutions the running of more than one gaming seminar could be accomplished with the use of one disk by having multiple data base files, DATABAS1, DATABAS2, etc. up to DATABAS9, one for each gaming seminar. Since the amount of space on the disk is still the same, an expansion to multiple data base files reduces the number of rounds of history of the urban region, that could be saved. For example, with the job RBMULTY, the data set DATABASE with its capacity for 10 rounds of history could be deleted and replaced with two data sets DATABAS1 and DATABAS2 each with a capacity for 5 rounds of

----

[1] CITY3 is an internal program name unique to the game CITYIV and should not be confused with the Game known as CITY III.

15

history. As could be noted from the study of the original VTOC, the disk
is originally configured as having only one data base file. The decision
to have multiple data base files should be done at the beginning of the
gaming seminars because the job RBMULTY would delete the existing
history, on DATABASE. THE JCL references must be changed for each phase
of the loading and running operation of the system.

G.   Problems with Hardware Requests

        Some computing centers do not allow users to have disk names which
do not conform to their type of ID format. If this restriction is enforced
when using CITYIV, a change in the serial number identification scheme
will result in numerous changes and problems with the running of CITYIV.
If this change is required, it will be necessary to change each reference in
all the JCL portions of the program. Further, the control parameters in the
installation phase step REMDISK of jobs RBMINSTL, CPYVOLID = YES and
PURGE = YES must be deleted.

III. APPENDICES

Appendix A: THE SYSTEM JCL LIBRARY

```
//*
//***************** RBM-SYSTEM JCL LIBRARY **********************************
//*
//* NAME
//*     RBMINSTL
//*
//* FUNCTION
//*        RBMINSTL IS USED TO RESTORE A 2319 OR 2316 DISK PACK WHICH
//*        IS PRIVATE WITH THE CITYIV SUBSET OF RIVER BASIN MODEL (RBM)
//*        SYSTEM FROM ITS TAPE COPY. NOTE THAT THE DISK MUST BE
//*        SPECIFIED WITH ITS SERIAL NUMBER IN DISKNUM =D12345
//*        AND THE DISK WILL BE RENAMED TO D00160 AFTER THE FIRST STEP.
//*        THE TAPE IS SPECIFIED WITH THE NUMBER IN TAPENUM = RBMJHU
//*        MOUNTED ON A 9 TRACK 800 BPI DRIVE.
//*
//*****************************************************************************
//*
//*        REMEMBER TO CHANGE  THE DISK TO THE NUMBER YOU ARE PROVIDED
//*        AT BOTH REFERENCES. - THE MESSAGE AND VOLUME PARAMETERS
//*        THE NEXT CARD DEFINES THE DISK TO THE OPERATOR.
/*MESSAGE    MOUNT DISK D12345
//*        DISK D12345 IS THE DISK PROVIDED BY THE COMPUTING CENTER
//*        REMEMBER TO CHANGE THE TAPE TO THE NUMBER OF THE TAPE YOU
//*        RECEIVED WITH THIS MODEL AT BOTH REFERENCES.
//*        THE NEXT CARD DEFINES THE TAPE TO THE OPERATOR.
/*MESSAGE    MOUNT TAPE RBMJHU,W
//*        TAPE RBMJHU IS THE TAPE PROVIDED WITH THE RBM SYSTEM AND
//*        LABELLED RBMJHU.
//*
//RBMDISK EXEC PGM=IEHDASDR
//SYSPRINT   DD SYSOUT=A
//*
//THEDISK    DD UNIT=2314,
//             VOLUME=(PRIVATE,,SER=(D12345)),
//             DISP=OLD
//*
//TAPE       DD UNIT=(2400),
//             VOLUME=(PRIVATE,,SER=(RBMJHU)),
//             DISP=OLD,
//             DSNAME=TAPE
//*
//SYSIN      DD *
 RESTORE TODD=THEDISK,FROMDD=TAPE,CPYVOLID=YES,PURGE=YES
//*
//*
```

18

```
//*
//****************** RBM-SYSTEM JCL LIBRARY ******************************
//*
//* NAME
//*     RBMLOAD
//* FUNCTION
//*     RBMLOAD LOADS THE DATABASE DEFINED BY DDNAME FT01F001 INTO BOTH
//*     THE ''DATABASE'' AND ''GM'' FILES. THIS PRODUCES ROUNDO OF THE
//*     GAME OUTPUT.
//*
//****************************************************************************
/*MESSAGE  MOUNT DISK D00160
//*
//JOBLIB     DD DSN=EPA049.LODMOD,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,PASS)
//*
//LOAD     EXEC PGM=CTYLDMN,REGION=190K
//*
//SYSABEND  DD SYSOUT=A
//*
//FT03F001  DD SYSOUT=A
//*
//FT04F001  DD DSN=EPA049.GM,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT05F001  DD DSN=SCRT,
//              UNIT=2314,
//             ·VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT06F001  DD SYSOUT=A
//*
//FT15F001  DD SYSOUT=A
//*
//*           DDNAME FT01F001 CHANGES TO DD * WHEN DATA IS IN JOB STREAM.
//*
//FT01F001  DD DSN=EPA049.DATADECK.LIBRARY(TWOCITY),
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//DUMP     EXEC PGM=CTYFLDP,REGION=190K
//*
//SYSABEND  DD SYSOUT=A
//*
//FT03F001  DD SYSOUT=A
//*
//FT04F001  DD DSN=EPA049.GM,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT05F001  DD DSN=SCRT,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT06F001  DD SYSOUT=A
```

19

```
//*
//FT08F001   DD DSN=EPA049.DATABASE,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT15F001   DD SYSOUT=A
//*
//FT01F001   DD *
F
//*
```

20

```
//*
//***************** RBM-SYSTEM JCL LIBRARY **************************************
//*
//* NAME
//*     RBMEDIT
//* FUNCTION
//*         RBMEDIT  READS THE ROUND INPUT (INPUT FROM A ROUND OF
//*         GAMING) AND ALTERS THE CURRENT DATABASE OF THE MODEL WITH
//*         THE CHANGES MADE BY CORRECT INPUTS.  INCORRECT INPUTS ARE
//*         INDICATED WITH SPECIFIC ERROR MESSAGES, AND THEY DO NOT
//*         AFFECT THE CURRENT DATABASE.
//*
//*****************************************************************************
//*
/*MESSAGE   MOUNT DISK D00160
//JOBLIB     DD DSN=EPA049.LODMOD,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,PASS)
//*
//EDIT      EXEC PGM=EDTMAIN,REGION=190K
//*
//SYSABEND   DD SYSOUT=A
//*
//FT03F001   DD SYSOUT=A
//*
//FT04F001   DD DSN=EPA049.GM,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT05F001   DD DSN=SCRT,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT06F001   DD SYSOUT=A
//*
//FT08F001   DD DSN=EPA049.DATABASE,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT15F001   DD SYSOUT=A
//*
//*         DDNAME FT01F001 CHANGES TO DD * WHEN DATA IS IN JOB STREAM.
//FT01F001   DD DSN=EPA049.DATADECK.LIBRARY(TWOTEST),
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
```

```
//*
//****************** RBM-SYSTEM JCL LIBRARY ********************************
//* NAME
//*    RBMCITY
//* FUNCTION
//*         RBMCITY GENERATES A NEW ROUND OF OUTPUT FROM THE CURRENT
//*         DATABASE WHICH IS SAVED. THE NEW DATABASE IS ALSO SAVED
//*         IN THE NEXT AVAILABLE  LOCATION OF THE THE DATA BASE FILE..
//***********************************************************************
//*
/*MESSAGE   MOUNT DISK D00160
//JOBLIB    DD DSN=EPA049.LODMOD,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,PASS)
//*
//DUMP     EXEC PGM=CTYFLDP,REGION=190K
//*
//SYSABEND  DD SYSOUT=A
//*
//FT03F001  DD SYSOUT=A
//*
//FT04F001  DD DSN=EPA049.GM,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
·//FT05F001  DD DSN=SCRT,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT06F001  DD SYSOUT=A
//*
//FT08F001  DD DSN=EPA049.DATABASE,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT15F001  DD SYSOUT=A
//*
//FT01F001  DD *
L        1
//*
//CITY3    EXEC PGM=CITY3,REGION=190K
//*
//SYSABEND  DD SYSOUT=A
//*
//FT03F001  DD SYSOUT=A
//*
//FT04F001  DD DSN=EPA049.GM,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT05F001  DD DSN=SCRT,
//             UNIT=2314,
//             VOL=(PRIVATE,RETAIN,SER=D00160),
//             DISP=(OLD,KEEP,KEEP)
//*
//FT06F001  DD SYSOUT=A
//*
```

22

```
//FT08F001   DD DSN=EPA049.DATABASE,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT15F001   DD SYSOUT=A
//*
//DUMP     EXEC PGM=CTYFLDP,REGION=190K
//*
//SYSABEND   DD SYSOUT=A
//*
//FT03F001   DD SYSOUT=A
//*
//FT04F001   DD DSN=EPA049.GM,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT05F001   DD DSN=SCRT,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT06F001   DD SYSOUT=A
//*
//FT08F001   DD DSN=EPA049.DATABASE,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT15F001   DD SYSOUT=A
//*
//FT01F001   DD *
//*
//* NAME
//*     RBMMAPS
//* FUNCTION
//*         RBMMAPS PRODUCES ONE COPY OF EACH OF THE RBM MAPS FROM THE
//*         CURRENT DATABASE IN THE GM FILE.
//*
//************************************************************************
//*
//MAPS     EXEC PGM=MAPA,REGION=190K
//*
//SYSABEND   DD SYSOUT=A
//*
//FT03F001   DD SYSOUT=A
//*
//FT04F001   DD DSN=EPA049.GM,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT05F001   DD DSN=SCRT,
//              UNIT=2314,
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT06F001   DD SYSOUT=A
//*
//FT08F001   DD DSN=EPA049.DATABASE,
//              UNIT=2314,
```

23

```
//              VOL=(PRIVATE,RETAIN,SER=D00160),
//              DISP=(OLD,KEEP,KEEP)
//*
//FT15F001  DD SYSOUT=A
//*
```

Appendix B: DATA SET DESCRIPTION

Appendix B: Data Set Description

1.   Data Sets

The data sets are described in the order of their listing in the
Volume Table of Contents of the disk volume D00160. Since these programs
were originally written for the Environmental Protection Agency, data
sets have the qualifier name EPA049 which is further qualified with a
generic name EPA049.GM. The first data set which is sequential, EPA049.GM,
is the game file. It contains the current status of the urban region as
described by a particular data base. The file is composed of approximately
3800 records, each 260 bytes long. Each record consists of two parts --
a directory and a data segment. The directory contains information which
describes the size, type, and location of the various records which comprise
the game file.

The data segment of the game file consists of data of varying types,
one byte logical, two byte integer, four byte integer and four byte real.
There are various kinds of data like arrays and vectors, and their contents
describe various things which might be population data, economic data or
simple pointers packed into 256 bytes of each record. The other four
bytes are used by the directory segment, two are used to identify the
disk location of a record and the other two are used as linkage to
similar data in another record, should the data continue out of the
present record.

2.   EPA049. DATADECK. Library

As the generic name LIBRARY indicates, this is a PDS (Partition Data
Set) in which the members are the contents of a library and each member
describes the initial data deck of a hypothetical or real urban region.
Some of the initial urban configurations are RAYWID and TWOCITY which are
described in the Director's Manual for RBM. The CITY MODEL type starting
configurations are BIG CITY, BLUECITY, TRICITY, AND WASHGTON. In addition,
there are two edit testing data input decks in the library, BLUETEST and
TWOTEST. BIGCITY, TRICITY AND BLUECITY are described as METROPOLITAN,
TRI-CITY and DUNBEATH in the CITYMODEL Director's guide.

It is important to note at this point that not all these initial data
decks have been completely debugged and although they have all been used
in gaming sessions, it is possible that a special sequence of rounds of
play might divulge new oversights with any one of these urban configurations.
It is hoped that the user would share the new information with the other
users of this manual.

26

3.   EPA049. DATABASE SCRT

This is a general purpose scratch file used by all the model's programs
for temporary storage of data. It is the programs working storage.

4.   EPA049. DATABASE

This is the data set which contains up to ten rounds of the history
of the region. If the users wish to save rounds zero through nine, it
would be saved on the fourteen extents of this data set in sequential
order from extent zero to fourteen. However, should the users want to
save rounds two through twelve and the process prescribed in Section II
of this Manual, under Running the Model is used, the most recent rounds
i.e., ten through twelve are stored in the extents zero through two and
the rounds three through nine are stored in the remaining extents. With
these data bases saved, the user could rerun any round of the game by
loading the particular data base into GM. Should he wish to save the
new data base produced, he has no choice but to save it after the most
recently stored data base or in the very first extents of the data set,
i.e., Extent Zero.

Care and efficient recording of all data bases stored must be
taken so as not to confuse the understanding of the contents of this
data base. However, should this recording become confused, it would be
necessary to develop a job which would be made of two steps, DUMP and
EDIT. The dump routine, CTYFLDP, would copy the unknown data base file
into EPA049.GM and EDTMAIN with no inputs would print the name and round
number of the data base. This procedure could be repeated for each of
the data base files that were saved. To get a specific data base file,
the control card on the input stream of the DUMP step must have L in
column one and the number one through ten right-justified in column ten.

5.   EPA049.LODMOD

The name symnolic of executable "Load Modules" of the system of
programs, indicates that these are the mainline programs which have been
previously linked and edited with all the relevant subprograms and are
ready for execution. There are six members of this partition data set,
CTYFLDP, EDTMAIN, CTYLDMN, CITY3, MAPA, VOTES and CTYWAT. Since each
of these except VOTES and CTYWAT have been described previously during
the process of running the model (See section II of this Manual) it will
only be necessary to define each partition in this Section, users can
refer directly to them in the appropriate section of this Manual.

a.   CTYFLDP is used at least once by all the jobs involved in the
running of the model. It is used to copy the contents of EPA049.GM into
EPA049.DATABASE and vise versa (See pages 19, 22 and 23).

b.   CTYLDMN is used to load a specific urban configuration from either EPA049.DATADECK.LIBRARY or from a user generated configuration which must be included in the job stream as a deck of cards, into EPA049.GM.

c.   EDTMAIN is the editing program that alters EPA049.GM with the successful input decisions of the current round of the urban region. It is used repeatedly during the production of the trial edits which indicates to the user the reasons for the failures of particular decisions. A description and explanation of each of the edit messages is given in Appendix C.

d.   CITY3 is the main program which performs all the functions in the simulation process

e.   MAPA produces all of the city maps, from the current data in EPA049.GM. A user who wishes to obtain a copy of a previous round must first use CTYFLDP to copy the particular data base file from EPA049.DHTABASE to EPA049.GM and then execute MAPA.

f.   VOTES, the only program that is not used every round, it is used to input the ballots of the social decisions during an election. Since elections are not held every round it was not necessary to include these input decisions with the routine ones controlled by the EDTMAIN program.

g.   CTYWAT is not used in the CITYIV version of the model but it provides for the inputting of water management decisions.

The five data sets described above are necessary for the running of the model. The other data sets listed in the VTOC are necessary for user modification of the system of programs. All modifications would need the source listings of the programs and documentation of the overall system.

6.   EPA049.SOURCE.LIBRARY

This is a PDS in which each member is a program or subprogram in its FORTRAN IV source language of the system of programs.

7.   EPA049.LIBFL

In this PDS, its members are the subprograms and programs in their object module format. This means that each subprogram has been already FORTRAN compiled and so they could be included into an executable module by the Linkage Editor.

All other files are usually user generated for a specific debugging task or modification.

Appendix C: EDIT ERROR MESSAGES

Appendix C: Edit Error Messages

   The EDIT program processes decisions one at a time in the order in
which they are submitted to it by the director. The program checks the
data submitted to it for two kinds of errors: coding (incorrect format
for a decision or key-punch error) and legality (violation of a rule of
the model, such as construction without utilities or sale of land
belonging to another decision-maker). When an error message is printed,
the decision to which it applies has been rejected, with a few exceptions
which are noted in the explanation of the error messages. In all cases,
if a decision does not receive an error message, the program has accepted
and processed the decision.

   This appendix contains a description of all error messages associated
with CITY IV. Since the "water module" may be added to CITY IV directly,
the error messages for this module are also included. It should be noted
that when this module is added to CITY IV, the customary name of the game
is then, "River Basin Model", rather than CITY IV.

1.   General Error Messages

   For all general errors, an indicator (▲) points to the approximate
location of the error.

   a.   INVALID $ ENTRY. Incorrect general decision code. All sub-
sequent decisions using this $ entry will be invalidated.

   b.   INVALID TEAM ENTRY. There is a mistake in the team identifica-
tion in the decision-maker location of the input card. Might be caused
by omitting second slash or mispunching "=".

   c.   NO CURRENT VALID $ ENTRY. No valid general decision code has
been entered or the last one entered is in error. This usually occurs
after a #1 error.

   d.   NO CURRENT VALID TEAM ENTRY. No valid team identification has been
entered in the decision-maker location of the input card or the last one
entered is in error.

   e.   NO RIGHT PARENTHESIS. The right hand parenthesis for an input
requiring one has been omitted. All lists, and only lists, must be enclosed
in parentheses.

   f.   NO LEFT PARENTHESIS. The left hand parenthesis for an input
requiring one has been omitted.

g.   INVALID LOCATIONS LIST. A list contained a mixture of parcel (even-even), intersection (odd-odd) and road locations (even-odd or odd-even).

h.   INCORRECT PUNCTUATION. The indicator points to the incorrect punctuation. Examples: comma (,), clash (/), etc.

i.   INVALID LAND USE. A wrong two-letter abbreviation for a land use was used.

j.   INVALID TEAM. A team identification (in a position other than where decision-maker is specified) is not a valid team name.

k.   MORE THAN 15 CHARACTERS. More than 15 digits fall between two successive commas. This might result if commas were omitted from the input card.

l.   NUMBER TOO HIGH. Too large of a number has been input. Check the input explanation form to see if scaling has been observed.

m.   NUMBER TOO HIGH OR TOO LOW. The entered number is not within the prescribed limits of this particular entry.

n.   INVALID CHARACTER IN NUMBER. An extraneous character has been added to a number. This could be a dollar sign for a land bid or price. Note that all figures are coded without commas.

o.   LIST NOT PERMITTED. Parentheses have been used to include several entries where only one entry is allowed.

p.   INCORRECT LOCATION ENTRY. The decision contains something other than a location on the board in a position which should contain a location.

q.   BLOCK ENTRY NOT PERMITTED. Opposite corners have been used to specify a zone when a zone is not permitted. Another way to put it is that in this list the character ">" is invalid.

r.   INVALID ROAD COORDINATES. The program accepts only even-odd or odd-even combinations that are on the board.

s.   MORE THAN 65 LOCATIONS IN LIST. When block input is used, a maximum of 65 parcels can be specified between the parentheses.

31

2. $ASMNT

    a.   SOMEONE ON TEAM (team name) IS TRYING TO ENTER ASSESSMENT INPUT. A decision-maker other than AS has input a decision using this code.

    b.   LOCATION ERROR. A road or intersection was specified. Assessment locations must be parcels.

    c.   NO PARCEL LIST FOR ASSESSMENT. A location has not been specified in column "C" for a type of assessment decision which requires a location (AD, AL, SL, SD).

    d.   (location) IS IN (jurisdiction). The decision-maker has attempted to assess a parcel which is in another jurisdiction.

    e.   UNNECESSARY PARCEL LIST FOR ASSESSMENT. A location has been specified in column "C" for a jurisdiction-wide decision setting the assessment ratio of a land use.

    f.   (code) IS NOT A RECOGNIZABLE CONTROL WORD. An incorrect letter code has been used.

    g.   (location) IS NOT A FARM PARCEL. A farm assessment has been input for a parcel which is not a farm.

3. $BUILD - $OUBLD

    a.   (team) CAN'T BUILD (land use) A decision-maker has attempted to build a type of land use not allowed him.

    b.   OU PRICE NON-NEGOTIABLE. A price has been entered in a $OUBLD input.

    c.   (number) IS NOT A JURISDICTION. The jurisdiction number input by a government department is not valid.

    d.   (location) UNASSIGNED. The indicated parcel is not assigned to a utility district. This message prints if there is a construction on a parcel which was loaded with utilities but not assigned to a utility district.

    e.   (team) OWNS (location). The decision-maker specified on the decision input as owning a location does not actually own that parcel.

    f.   (location) IS UNDEVELOPED. A non-zero old level has been input for a parcel which is undeveloped.

g. (location) IS A FARM OWNED BY (team). The input specified a construction on a farm parcel.

h. (location) IS NOT A (land use), IT IS A (land use). A land use has been input with a previous level, but the parcel is not developed in that land use.

i. THERE'S NO (land use) AT (location). The input specifies an existing land use on a parcel but the parcel does not contain that land use.

j. (land use) AT (location) IS LEVEL (land use). The old level of development input does not equal land use's actual level.

k. (number) % IS REQUIRED ON (location) - ONLY (number) % IS AVAILABLE. The team does not own sufficient land on the parcel for the intended construction.

l. JURISDICTION (number) IS RESPONSIBLE FOR (location). A road or terminal construction decision has been input by a jurisdiction which does not control that location.

m. (location) IS IN (jurisdiction number). The parcel is not in the jurisdiction of the decision-maker.

n. LEVEL ERROR. Old and new levels are identical.

o. QI ERROR. The quality index input is less than 40 or greater than 100.

p. ONLY RA'S CAN HAVE PRIVATE UTILITIES. A land use other than RA has attempted to be constructed using private utilities.

q. LOCATION ERROR. The land use specified cannot be at the designated location. Such would be the case if a road were specified for a parcel or if an economic activity were specified on a road or intersection.

r. COST TO (team) FOR BUILD ON (location) IS $(price) ONLY HAS $(capital balance). The team constructing does not have enough money to pay for the attempted construction.

s. REQUIRES LEVEL (number) UTILITY SERVICE - ONLY HAS LEVEL (number). The level of utility service installed on the parcel does not provide as many utility units as are required by the new level of development.

t. EXCEEDS UTILITY PLANT CAPACITY. The number of utility units which the proposed construction requires plus the number of utility units already served by the utility plant which serves the parcel on which the construction is located exceeds the plant's capacity (2400 times the plant's level).

u.   REALLOCATION OF SERVICE MUST PRECEDE DEMOLITION. There has been an attempt to demolish a utility plant without first assigning all of the parcels served by that plant to another utility plant.

v.   UNITS CONSUMED MUST BE DECREASED TO (number) BEFORE DEMOLITION. There has been an attempt to decrease the level of a utility plant when the plant already serves more than 2400 times its new level.

w.   (UT or CI) CAN ONLY BUILD OUTSIDE. There has been an attempt to build a utility plant or a construction industry with the $BUILD input code.

x.   JOB EXCEEDS (CI location) 'S CAPACITY (number of equipment units required for the construction) / (number of equipment unless remaining in CI's capacity). The CI does not have enough remaining capacity to perform the construction.

y.   (team) HAS AN OUTSTANDING CONTRACT TO BUILD A (land use) AT (location). A team (contractee) has input a construction contract for a land use and location for which it already has a contract.

z.   (location) IS ZONED (zoning code) WHICH PROHIBITS (land use). The attempted construction violates zoning.

4. $BYCT

a.   E OR S. A letter other than E or S was in column "a".

b.   (department) DOES NOT BOYCOTT. A government department appears as the decision-maker. Departments do not boycott.

c.   U S OR W. A letter other than U, S, or W appeared in column "c".

d.   WORK BOYCOTTS ARE SOCIAL BOYCOTTS. An economic decision-maker tried to input a decision to boycott work. Economic decision-makers can only input shopping boycotts.

e.   (location) IS NOT A (LNDUSE or CLASS). A social boycott has been input with a letter in column "b" which is not a class or a land use in column "d" which is not an acceptable land use code.

f.   U IS FOR SYSTEM-WIDE BOYCOTT OF BUS OR RAIL BY SOCIAL CLASS. A location has been input for a use boycott.

g.   ENTER S OR B FOR STOP OR BEGIN. A letter other than S or B was used in column "e".

34

h.   (team) CANNOT BOYCOTT (department). A shopping boycott has been input against a department.

i.   (location) IS UNDEVELOPED. The location boycotted (column "d") is undeveloped.

j.   (location) IS A RESIDENCE. The location boycotted (column "d") is a residence.

k.   (location) IS A (land use). A shopping boycott has been input at a location which is not commercially developed.

l.   (team)'S (class or land use)'S ARE NOT BOYCOTTING (SHOP, WORK, or USE)- (location or department). An S in column "e" has indicated that an existing boycott is to be stopped but the boycott does not exist.

m.   (team)'S (class or land use)'S ARE ALREADY BOYCOTTING (SHOP, WORK, or USE) - (location or department). An attempt was made to begin a boycott which already exists.

n.   (department) DOES NOT HIRE. An attempt was made to boycott work at a department that does not hire population units.

5. $CASH

a.   (code input) IS NOT A VALID CODE. The letter code in column "a" is not a valid letter code.

b.   AS HAS NO CASH. The Assessment Department has been designated as a giver or receiver of cash. AS does not have an account.

c.   (FOURTH or FIFTH) ENTRY MUST BE CAP OR CUR. A cash transfer involving a government department must specify the department's capital or current account. If CAP or CUR is used to designate an economic team's account, the designation is ignored and is assumed by the program to be PVT.

d.   (team: PZ or CH) HAS ONLY A (CAPITAL or CURRENT) ACCOUNT. Either Chairman or Planning and Zoning has been designated as having an account which it does not in fact have.

e.   ONLY CHAIR MAY USE (code input). A team other than the Chairman has used a code other than C in column "a".

f.   (team) DOES NOT RECEIVE APPROPRIATIONS. Chairman has attempted to grant an appropriation using CP or CR to an economic team, UT, RAIL or CH.

35

g.   NOT AN APPROPRIATION - DIFFERENT JURISDICTIONS. Chairman has attempted to grant an appropriation using CP or CR to a department in another jurisdiction, or BUS or RAIL.

h.   WRONG SUBSIDY. The Chairman has either used SB in column "a" to subsize UT, BUS, or RAIL or used CURS or CAPS in column "a" to subsize an economic team. CURS and CAPS are used for departments; SB is used for economic teams.

i.   (team) DOES NOT RECEIVE SUBSIDIES. Only UT, BUS, and RAIL can receive subsidies through CURS or CAPS.

j.   LOCATION ENTRY REQUIRED FOR (social team)'S (class). A cash transfer involving a social decision-maker has omitted the residence location of the Pl's.

k.   THERE ARE NO (class) Pl's ON (location). A cash transfer involving a social decision-maker has specified a parcel on which no Pl's of the designated class live.

l.   (social decision-maker) DOES NOT CONTROL (class) ON (location). The social decision-maker designated as controlling a class on a parcel does not in fact control those Pl's.

m.   (social team)'S class ON (location) ONLY HAVE $ (savings). The social decision-maker attempted to transfer an amount greater than the number of Pl's times the sum of the savings per Pl and the miscellaneous income per Pl. Note that miscellaneous income is negative if the class has transferred more money than it has received.

n.   THERE IS NO (department and jurisdiction). The jurisdiction number input for a department exceeds the number of jurisdictions being used in the model.

o.   NULL TRANSACTION. A decision-maker has attempted to transfer money from an account to the same account. For economic, the giver and receiver would match and both accounts would be capital or current; for social, the giver and receiver would match, the class giving and receiving would match, and the locations would match.

p.   (team) ONLY HAS $(amount). A team has less money in its capital account (total capital revenue less capital expenditures) than it is attempting to transfer. Note that there is no check on a transfer from a current account.

6. $CVPT

   a.   (code input) IS NOT A VALID CODE. A code other than one allowed
by $CVPT or $OTHER has been input in column "a".

   b.   THERE IS NO UTILITY PLANT ON (location). The utility plant location
specified in column "c" does not contain a utility plant on a decision to
change utility service.

   c.   THE PLANT AT (location) IS UNDEVELOPED. The Utility Department
has only undeveloped land at the location specified in column "c" on a
decision to change utility service.

   d.   (location) IS IN JURISDICTION (number). The location designated
in column "c" is in a different jurisdiction from the one of the Utility
Department which input a decision to change utility service.

   e.   (number) IS NOT A VALID UTILITY LEVEL. The new level of service
specified on a decision to change utility service is not a number between 0
and 9.

   f.   LOCATION ERROR. A location other than a parcel has been specified
in column "b". The location should be a parcel.

   g.   (UTILITY or INTAKE or OUTFLOW) PLANT AT (location) CAN'T CHANGE.
An attempt has been made to change the utility district in which a parcel
containing a utility, inflow, or outflow plant is located. The utility
district to which such a parcel is assigned cannot be changed until the
appropriate plant(s) has been demolished.

   h.   (location) USES MORE THAN (number). The private development on
the parcel for which there was an attempt to change the level of utility
service requires more utilities than the new level of service would
provide.

   i   INSTALLATION AT (location) COSTS $(amount) (department) ONLY
HAS $(amount). The Utility Department has insufficient funds in its
capital balance to perform the installation of utility services.

   j.   NON-CONNECTABLE - (location) (location) etc. Each listed parcel
is not contiguous to a parcel having utilities and served by the designated
utility plant. Contiguous parcels are the eight parcels surrounding a
parcel.

37

k.   TEAM (team name) DOES NOT (input code). A decision-maker has input a decision type in column "a" which he is not allowed to make.

l.   (zoning code input) IS NOT A VALID ZONING CODE. The two-digit zoning code input in column "c" on a decision to change zoning is not one of the zoning codes allowed in the model.

m.   (input code) IS TOO (HIGH or LOW). The value given to a rent (R), salary (S), maintenance level (M), price (P), number of employees (E), public institutional land (PI or RPI), BG-BS contract percent of purchases (C), or preempted land (PLND or RPLND) exceeds the maximum or minimum amount allowed that value.

Function	Input Minimum	Input Maximum
Rent (R)	0	250
Salary (S)	PL 12	50
	PM 25	100
	PH 50	200
Maintenance Level (M)	0	100
Price (Utility)	0	1600
Price (BC - BS)	500	1500
Price (PC-PS)	50	150
Employees (E)	0	6
All others	0	100

Note: All of these limits are overridden if there is a "1" in column "f".

n.   (PI, RPI, PLND or RPLN) REQUIRES SPECIFICATION OF PERCENT OF PARCEL. Column "c" did not contain a specification of what percent of the parcel was to be changed.

o.   (PI or RPI) COSTS $(amount) - PZ (jurisdiction) ONLY HAS $(amount) IN CAPITAL FUNDS. The Planning and Zoning Department does not have sufficient funds to carry out the transaction involving public institutional land.

p.   (location) MAINTENANCE SET TO MAXIMUM -- (maintenance level). There was an attempt to increase the maintenance level of a residence to more than 20 points above the lowest quality index which the residence ever reached. The program changes the desired maintenance level to the maximum allowed and then accepts the decision. This is one of the few error messages that do not indicate total rejection of a decision.

q.   ONLY (number)% OF (location) IS (PI or PLND). There was an attempt to take more land out of public institutional or preempt use than was actually in that use.

r.   (team)'s (BG or BS) AT (location) HAS NO CONTRACT WITH (department). There was an attempt to cancel a BG or BS contract, but the contract did not exist.

s.   USE $OTHER FOR (input code). The $CVPT code was used when $OTHER should have been used.

t.   (team) OWNS (location). The economic decision-maker specified on the decision input as owning a location does not actually own that location.

u.   (location) IS UNDEVELOPED. An economic decision-maker has attempted to change something on a parcel which is undeveloped.

v.   (location) IS A (land use) AND DOES NOT (SET PRICES, EMPLOY, SET, RENTS, or CONTRACT). An economic decision-maker has attempted to make a decision which is not allowed for the economic activity type located on that parcel.

w.   THERE'S NO (MS, SC or PI) AT (location). A MS or SC department tried to change a maintenance level or employee request at a parcel on which the department has no constructed facility, or PZ tried to remove public institutional use of parkland from a parcel on which none exists.

x.   (number)% IS REQUIRED ON (location) - ONLY (number)% IS AVAILABLE. PZ does not have enough parkland at the location to develop or remove the amount of public institutional land (PI or RPI), or there is not enough privately-owned and undeveloped land on the parcel for the director to create or remove preempted land (PLND or RPLND).

y.   (location) IS IN (jurisdiction). The parcel is not in the juris-diction of the decision-maker.

z.   (location) IS A FARM OWNED BY (team). An economic decision-maker specified not a business or residence parcel but a parcel which is part of a farm. Decisions regarding farms use $)DDS or $PU.

7. $ENDS

a.   (code input) IS INVALID CODE. A code other than L, R, W, or P has been input in column "a".

b.   (land use) AT (location) DOES NOT RECYCLE. The land use at that location is not a basic industry, so it cannot recycle water.

39

c.   OPERATING LEVEL (number) AT (location) IS TOO HIGH. An economic decision-maker has attempted to raise the operating level at a business above its constructed level. The operating level cannot be above the constructed level.

d.   (location) IS NOT A LAKE PARCEL. The director attempted to specify water quality on a parcel which does not contain a lake.

e.   (number) IS INVALID WATER QUALITY. The specified water quality is not an integer between 1 and 9.

f.   NO WATER ON (location). The director attempted to specify a miscellaneous pollution input on a parcel which has no water.

g.   (location) IS UNDEVELOPED. There was an attempt to set an operating level at a parcel which is undeveloped.

h.   (location) IS RESIDENTIAL. There was an attempt to set an operating level at a parcel which is developed residentially.

i.   NO VOLUME OF POLLUTION INPUT FOR (location). The director specified miscellaneous pollutants to be dumped on a parcel but did not specify a volume of effluent.

j.   (location) IS A FARM OWNED BY (team). The location is not a business which can recycle or set an operating level; it is a farm.

k.   (team) OWNS (location). The economic decision-maker specified on the input as owning a location does not actually own that parcel.

l.   TOO MANY POLLUTANTS ENTERED FOR (location). The director specified miscellaneous pollutants to be dumped on a parcel but listed more than seven pollutant types and one water volume.

8. $FSA

a.   (team) CANNOT REQUEST FEDERAL-STATE AID. The decision-maker is a department other than SC or HY, which are the only departments which can request Federal-State aid.

b.   SC MUST INPUT PARCEL COORDINATES TO FSA. A School Department did not specify the parcel location for which aid was requested.

c. HY MUST INPUT ROAD COORDINATES TO FSA. A Highway Department did not specify the road location for which aid was requested.

d. PARCEL AT (location) IS NOT IN JURISDICTION OF (department). A School Department has requested aid to build on a parcel which is not in its jurisdiction.

e. ROAD AT (location) NOT IN JURISDICTION OF (department). A Highway Department has requested aid to build at a location which is not in its jurisdiction.

f. (HY or SC) AT (location) IS LEVEL (number). Aid has been requested for a level of construction that is less than or equal to the existing level of development at the location.

g. LEVEL (number) AID IS AVAILABLE FOR (HY or SC) AT (location). Aid has already been granted for a development at the location for a level greater than or equal to the requested level.

h. (department) HAS ENTERED (number) REQUESTS. The School or Highway Department has already made the maximum number of FSA requests allowed it in a round. Schools can make 3 requests; Highways can make five requests.

i. AID REQUEST OF (department) FOR (location) (GRANTED or DENIED). This message states whether or not the department's aid request was granted.

9. $ODDS

a. (number) IS INVALID RIVER BASIN. The code number of the river basin input on a decision to set dam priorities does not match the code number of any river basin on the board.

b. INVALID FLOOD LEVEL IN RIVER BASIN (number). The director has input a flood level which does not fall between 1 and 100.

c. INVALID FARM CODE NUMBER, (farm code input). A decision to set a fertilizer level specified a farm code number that does not match that of any farm on the board.

d. INVALID FERTILIZER FACTOR, (number). The fertilizer level specified is not between 0 and 3.

e. (team) OWNS FARM (number). The decision-maker does not own the farm having the code number which he specified.

f. (code input) IS INVALID CODE. A letter code other than A, B, C, F, or R appeared in column "a".

41

10. $OTHER

a.   (code input) IS NOT A VALID CODE. A code other than one allowed by $OTHER or $CVPT has been input in column "a".

b.   TEAM (team name) DOES NOT (input code). A decision-maker has input a decision type in column "a" which he is not allowed to make.

c. $(amount) NEEDED - $(amount) AVAILABLE. The Bus or Rail Company has attempted to purchase rolling stock costing more than its available capital funds.

d.   (BUS or RAIL) ONLY HAS (number)UNITS. The Bus or Rail Company has attempted to sell more rolling stock than it owns.

e.   USE $CVPT FOR (input code). The $OTHER code was used when $CVPT should have been used.

f.   (team) DOES NOT SET WELFARE. A decision-maker other than a Chairman has input a decision with "W" in column "a". W is for setting welfare payments only.

g.   PAYMENT IS TOO HIGH. The Chairman attempted to set the welfare payment higher than the maximum of $10,000 per unemployed worker. The coded input for the payment should be 100 or less.

h.   EA IS AN INVALID CODE. A department other than Schools has used the code "EA" in column "a".

i.   (PZ or CH) CANNOT FLOAT (2 or 25) YEAR BONDS. Planning and Zoning has attempted to float a 2-year (current) bond or Chairman has attempted to float a 25-year (capital) bond. PZ has only a capital account; Chairman has only a current account.

j.   INTEREST RATE IS (number)%. This message merely shows the interest rate set for a bond or loan from the Outside. The transaction is complete; this is not an error message.

k.   SCALE BOND IN 10,000'S. If a bond for $900 million or more is input, the program assumes that the dollar amount was incorrectly scaled. The decision is rejected.

l.   ONLY 2 OR 25 FOR TERM. A bond or loan was input with a term other than 2 or 25.

m.   ILLEGAL DEPARTMENT. A department has attempted to make a decision which is not allowed it.

n. ILLEGAL ROAD TYPE. The road type specified is not 1, 2, or 3.

o. (team) ONLY HAS (amount). A team has attempted to lend more money than it has available.

p. USE BONDING ROUTINE. Either a department used "LO" in column "a" or an economic team used LO but did not specify a borrower or an interest rate. Bonds and loans from the Outside use "BO" in column "a".

q. SCALE LOAN IN 10,000'S. If a loan for $900 million or more is input, the program assumes that the dollar amount was incorrectly scaled. The decision is rejected.

r. INVEST COSTS $(amount) - (team) ONLY HAS $(amount) IN CAPITAL FUNDS. An economic team has attempted to invest more money in stocks than it has in available cash.

s. (team) ONLY HAS $(amount) IN (SPECULATIVE or CONSERVATIVE) INVESTMENTS. An economic team has attempted to sell more investments than it has.

t. THERE IS A CI AT (location). The director has attempted to specify NOCI, but there is still at least one CI on the board. All CI's must be demolished before NOC1 is accepted by the program.

u. (amount) LOAN EXCEEDS LIMIT OF (amount that can still be borrowed). TOTAL DEBT LIMIT IS (amount) PRESENT DEBT IS (amount). The economic team has attempted to borrow more money from the Outside than its debt limit allows. There is no limit on the amount which a team can borrow from another team.

11. $PU

a. OUTSIDE DOES NOT BUY LAND. "OU" was input on the decision-maker purchasing a parcel of land. The Outside cannot purchase land.

b. (department) CAN'T OWN LAND. CH, AS, or BUS was input as the decision-maker purchasing a parcel of land. Those departments cannot own land.

c. DIFFERENT AREAS. Departments in different jurisdictions attempted to transfer land.

d. ONLY DEPT'S SELL PART TO PVT. A private team attempted to purchase part of a parcel from a private team by specifying a number other than "0" in column "d".

43

e.   (location) COSTS $(amount) - (team) ONLY HAS $(amount). The
buyer does not have enough funds to make the land purchase.

f.   (team) OWNS (location). The private owner of a parcel specified
in column "c" is not the parcel's actual private owner.

g.   (location) IS IN (jurisdiction). The parcel is not in the jurisdiction
specified on the input.

h.   (team) CAN ONLY SELL (amount) ON (location). A team has attempted
to sell more land on a parcel than it has undeveloped there.

i.   (team) (amount) BID ON (location)(ACCEPTED or REJECTED
(probability)/(random number). If the probability is less than the random
number, the bid has been accepted. This is not an error message; it
reports the outcome of an unsolicited bid on Outside-Owned land.

12. $RAIL

a.   TEAM (team name) CANNOT ENTER RAIL INPUT. A team other than
RAIL has used the $RAIL code.

b.   LIST MUST BE OF PARCELS. The list of parcels over which the
track being constructed is on the surface contains a location which is
not a parcel.

c.   SAME INTERSECTION PAIR TO BUILD RR (location). On a decision to
build a track segment the same intersection was given for the beginning and
end points. If a station is to be constructed, only one intersection is
specified. If a track is to be constructed, two different intersections
are specified.

d.   RAIL SEGMENT FROM (intersection location) TO (intersection location)
NOT BUILT. There is already a track between the designated intersections,
so a new one was not put there by the program. There can be only one track
directly between two intersections.

e.   *** NO RAILROAD LAND ON PARCEL (location). The Rail Company does
not own any land on a parcel where it has specified that track will be on
the surface.

f.   *** PARCEL (location) WAS NOT SPECIFIED. A parcel on which a
surface track segment must be located in order to connect the designated
intersections was not specified on the input as being a parcel over which
a surface track would go. A track segment directly connecting two stations
must be either entirely on the surface or entirely underground.

44

g.   NOT A VALID INTERSECTION OR INTERSECTIONS ARE EQUAL (location)
(location). At least one of the locations is not an intersection location
or the intersections are identical.

h.   RAIL ONLY HAS $(capital balance) - NO STATION BUILT AT (location).
The Rail Company does not have sufficient funds to construct the designated
station.

i.   STATION ALREADY EXISTS AT (location). There is already a rail
station at the location where a station was to be constructed by the decision
input.

13. $REDIST

a.   LOCATION ERROR. A road or intersection was specified in column
"b" where a list of parcels should appear.

b.   NO PARCEL LIST INCLUDED FOR REDISTRICTING. Column "b" was blank.
A list of parcels to be added to the district should appear there.

c.   TEAM (name) CANNOT REDISTRICT. A team other than MS or SC
tried to use the $REDIST input code.

d.   (location) HAS NO (MS or SC). The location specified in
column "a" does not have a school or MS on it.

e.   (location) IS IN JURISDICTION (number). A school or MS location
which is not in the jurisdiction of the decision-maker has been specified
in column "a".

f.   PARCEL AT (location) IS NOT IN JURISDICTION OF TEAM (name).
A parcel which is not in the jurisdiction of the decision-maker has been
specified in column "b".

After all decisions have been processed, the program checks that districts
consist of contiguous parcels. One of two error messages indicates that
redistricting has failed:

1.   PROPOSED REDISTRICTING RESULTS IN DISTRICT FOR (SC or MS) AT
(location) BEING DISCONTINUOUS. The district which was to have been
served by the school or MS does not consist of contiguous parcels.

2.   THERE IS NO LONGER A (SC or MS) AT (location). A redistricting
decision would have added parcels to a district in which the school or MS
was demolished.

In either case, the error message is followed by: (SC or MS) REDISTRICTING
FOR JURISDICTION (number) REJECTED.

45

14. $ROUT

        a.   *** BUS OR RAIL NOT SPECIFIED. A decision-maker other than
BUS or RAIL used the $ROUT input code.

        b.   *** ROUTE NOT FOUND. There was an attempt to eliminate a route
by specifying a new level of 0 in column "c", but there is no route with
the code number specified in column "a".

        c.   *** NO INTERSECTIONS SPECIFIED. A list of intersections where
a route is to go (column "d") included either one or no intersections.

        d.   *** BUS ROUTES MUST FOLLOW ROADS. Two successive intersections
do not lie along the same row or the same column, i.e., the part of the
bus route specified attempts to cross parcels diagonally. Bus routes
must follow roads, i.e., the segments must be horizontal or vertical.

        e.   NO ROAD (EAST, WEST, NORTH, or SOUTH) FROM (intersection). A bus
route has been specified as travelling along a roadbed. Bus routes must
be along roads.

        f.   *** NO TRACK FROM (intersection) TO (intersection). A rail
route has been specified between two intersections which are not
directly connected by a track segment.

        g.   *** NO STATION ON (intersection). There is no station at a
location which has been designated as a rail stop.

15. $TAXES

        a.   (number) EXCEEDS TAX MAXIMUM OF 99. The maximum tax rate of
9.9% has been exceeded by the decision. The maximum limitation is waived
if there is a "1" in column "c".

        b.   ONLY CH1, CH2, or CH3 CAN ENTER TAXES. A decision-maker other
than a Chairman has used the $TAXES code.

        c.   L, D, RI, EI, RA, EZ, G, or S. A code other than one listed
above was used in column "a".

16. $TIME

        a.   ONLY PVT ALLOCATES. Only a social decision-maker can input a
time allocation decision.

        b.   ONLY L1, L2, L3, M1, M2, M3, H1, H2, OR Hr. These population
unit codes by jurisdiction are the only ones allowed (column "a").

46

c.   HIGH CAN'T ALLOCATE FREE SCHOOL.   Time for PH has been allocated to free education (column "b").

d.   TIME ADDS TO (total of units if over 100).   An allocation of more than 100 time units was attempted.

e.   LOCATION ERROR.   If intersection or road segment is input as a location for P1's.

f.   (team) DOES NOT CONTROL (H, M, or L) ON (location).   A team has attempted to make time allocation decisions for a class on a parcel over which it does not have control.

g.   THERE ARE NO(H, M, L)'S ON (location).   Time has been allocated for a class of P1's on a parcel where no members of that class reside.

h.   (location) IS IN (jurisdiction number).   If the specified location is not in the jurisdiction indicated by the number after H, M, or L (column "a").

i.   LOW CAN'T ALLOCATE PAY SCHOOL.   Time for PL has been allocated to pay education.

j.   (team) DOES NOT CONTROL POPULATION.   The social decision-maker input on the decision is not a valid social decision-maker as specified when the original data base was loaded.

17. $VALUE

a.   (team) DOES NOT SET TIME VALUE.   A team other than a social decision-maker has attempted to use the $VALUE code.

b.   L, M, or H.   Column "a" contains a character other than L, M, or H.

18. $WRBED

a.   (location input) IS NOT LEGIT LOCATION.   The location input in column "b" is not a parcel location on the board.

b.   (code input) IS INVALID CODE.   The program did not recognize the letter code input in column "a".

c.   (location) IS INVALID DISTRICT PLANT LOCATION.   The parcel specified as having a utility plant does not in fact have a utility plant on it.

d.   (code input) IS INVALID TREATMENT TYPE. The type of effluent treatment plant input is not CL, PT, ST, or TT.

e.   (code input) IS INVALID I-O CODE. The code input is not "IN" or "OUT".

f.   (location) HAS NO TREATMENT PLANT. A Utility Department tried to build a treatment plant in a district which already has a treatment plant of that type (type being intake or outflow). The other treatment plant must be demolished before a plant at a different location in the same same utility department can be constructed.

g.   NOT ENOUGH LAND AT (location). The Utility Department does not have enough land for the desired treatment plant construction.

h.   (location) IS INVALID (A, P, or M) SAMPLING STATION LOCATION. The type of sampling station input cannot function at the location input. For A, the location must have surface water; for P, the location must have an economic activity; for M, the location must have a municipal outflow point.

i.   (team) OWNS (location). The economic decision-maker input as owning a parcel does not actually own that parcel.

j.   BI TREATS OUTFLOW ONLY. There was a decision to build an intake treatment plant at a business. A basic industry can build an outflow plant only.

k.   (land use) DOESN'T TREAT EFFLUENT. The economic activity on the parcel is not a basic industry, so it cannot treat its effluent.

l.   OLD LEVEL IS NOT (level input). The old level of treatment plant specified on the decision input does not match the plant's actual level.

m.   COST TO (team) FOR WRBLD ON (location) IS $(amount), HAS ONLY $(amount). The team does not have enough money to perform the construction.

n.   TEAM MUST BE UTILITY. A team other than the Utility Department input a decision to locate an intake point, an outflow point, or a sampling station.

o.   NO WATER ON (location). There was an attempt to locate an intake or outflow point on a parcel which is not a lake or does not contain surface water.

19. $WRPRC

     a.   TEAM MUST BE UTILITY. A team other than a Utility Department
used the $WRPRC code.

     b.   (land use) DOES NOT USE MUNICIPAL WATER. The land use for which
the department attempted to set a price is a surface water user, a
government department, or nothing. Prices can be set only for municipal
water users.

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15. Supplementary Notes

16. Abstracts

This manual is written for an IBM 360/70 computer. It describes the necessary Fortran & JCL commands required for Computer operation of the CITY IV game. Test commands and sequences are presented along with complete computer operating instructions for the Game. It is expected that this manual, along with a Game Director's manual will provide complete instructions for the operation of CITY IV.

17. Key Words and Document Analysis.   17a. Descriptors

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17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

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